



**[4910-13]**

**DEPARTMENT OF TRANSPORTATION**

**Federal Aviation Administration**

**14 CFR Part 25**

**[Docket No. FAA-2016-9296; Special Conditions No. 25-647-SC]**

**Special Conditions: Bombardier Inc., Model BD-700-2A12 and BD-700-2A13 Series  
Airplanes, Electronic Flight Control System: Lateral-Directional and Longitudinal  
Stability, and Low-Energy Awareness**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Final special conditions; request for comments.

**SUMMARY:** These special conditions are issued for the Bombardier Inc. (Bombardier) Model BD-700-2A12 and BD-700-2A13 series airplanes. These airplanes will have a novel or unusual design feature when compared to the state of technology envisioned in the airworthiness standards for transport-category airplanes. This design feature is lateral-directional and longitudinal stability, and low-energy awareness, provided through an electronic flight-control system (EFCS). The applicable airworthiness regulations do not contain adequate or appropriate safety standards for this design feature. These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

**DATES:** This action is effective on Bombardier on **[INSERT DATE OF PUBLICATION IN THE FEDERAL REGISTER]**. We must receive your comments by **[INSERT DATE 45 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER]**.

**ADDRESSES:** Send comments identified by docket number FAA-2016-9296 using any of the following methods:

☐ *sFederal eRegulations Portal:* Go to <http://www.regulations.gov/> and follow the online instructions for sending your comments electronically.

☐ *aMail:* Send comments to Docket Operations, M-30, U.S. Department of Transportation (DOT), 1200 New Jersey Avenue, SE., Room W12-140, West Building Ground Floor, Washington, DC, 20590-0001.

☐ *Hand Delivery or Courier:* Take comments to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

☐ *oFax:* Fax comments to Docket Operations at 202-493-2251.

*Privacy:* The FAA will post all comments it receives, without change, to <http://www.regulations.gov/>, including any personal information the commenter provides. Using the search function of the docket Web site, anyone can find and read the electronic form of all comments received into any FAA docket, including the name of the individual sending the comment (or signing the comment for an association, business, labor union, etc.). DOT's complete Privacy Act Statement can be found in the **Federal Register** published on April 11, 2000 (65 FR 19477-19478), as well as at <http://DocketsInfo.dot.gov/>.

*Docket:* Background documents or comments received may be read at <http://www.regulations.gov/> at any time. Follow the online instructions for accessing the docket or go to Docket Operations in Room W12-140 of the West Building Ground Floor at 1200 New Jersey Avenue, SE., Washington, DC, between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

**FOR FURTHER INFORMATION CONTACT:** Joe Jacobsen, FAA, Airplane and Flightcrew Interface, ANM-111, Transport Airplane Directorate, Aircraft Certification Service, 1601 Lind Avenue SW., Renton, Washington 98057-3356; telephone 425-227-2011; facsimile 425-227-1320.

**SUPPLEMENTARY INFORMATION:** The FAA has determined that notice of, and opportunity for prior public comment on, these special conditions is impracticable because these procedures would significantly delay issuance of the design approval and thus delivery of the affected airplanes.

In addition, the substance of these special conditions has been subject to the public comment process in several prior instances with no substantive comments received. The FAA therefore finds that good cause exists for making these special conditions effective upon publication in the **Federal Register**.

### **Comments Invited**

We invite interested people to take part in this rulemaking by sending written comments, data, or views. The most helpful comments reference a specific portion of the special conditions, explain the reason for any recommended change, and include supporting data.

We will consider all comments we receive by the closing date for comments. We may change these special conditions based on the comments we receive.

### **Background**

On May 30, 2012, Bombardier applied for an amendment to Type Certificate No. T00003NY to include the new Model BD-700-2A12 and BD-700-2A13 series airplanes. The Model BD-700-2A12 and BD-700-2A13 series airplanes, which are derivatives of the BD-700

currently approved under Type Certificate No. T00003NY, are ultra-long-range, executive-interior business jets, with a passenger capacity of 19.

### **Type Certification Basis**

Under the provisions of Title 14, Code of Federal Regulations (14 CFR) 21.101, Bombardier must show that the Model BD-700-2A12 and BD-700-2A13 series airplanes meet the applicable provisions of the regulations listed in Type Certificate No. T00003NY, or the applicable regulations in effect on the date of application for the change, except for earlier amendments as agreed upon by the FAA.

If the Administrator finds that the applicable airworthiness regulations (i.e., 14 CFR part 25) do not contain adequate or appropriate safety standards for the Bombardier Model BD-700-2A12 and BD-700-2A13 series airplanes because of a novel or unusual design feature, special conditions are prescribed under the provisions of § 21.16.

Special conditions are initially applicable to the model for which they are issued. Should the type certificate for that model be amended later to include any other model that incorporates the same novel or unusual design feature, or should any other model already included on the same type certificate be modified to incorporate the same novel or unusual design feature, these special conditions would also apply to the other model under § 21.101.

In addition to the applicable airworthiness regulations and special conditions, the Bombardier Model BD-700-2A12 and BD-700-2A13 series airplanes must comply with the fuel-vent and exhaust-emission requirements of 14 CFR part 34 and the noise-certification requirements of 14 CFR part 36.

The FAA issues special conditions, as defined in 14 CFR 11.19, in accordance with § 11.38, and they become part of the type certification basis under § 21.101.

## **Novel or Unusual Design Features**

The Bombardier Model BD-700-2A12 and BD-700-2A13 series airplanes will incorporate the following novel or unusual design feature:

Lateral-directional and longitudinal stability, and low-energy awareness, through an electronic flight-control system.

## **Discussion**

The EFCS on the Bombardier Model BD-700-2A12 and BD-700-2A13 series airplanes contain fly-by-wire control laws that can impact static stability; therefore, the conventional requirements in the regulations are not always met.

Positive static-directional stability is defined as the tendency to recover from a skid with the rudder free. Positive static-lateral stability is defined as the tendency to raise the low wing in a sideslip with the aileron controls free. These control criteria are intended to accomplish the following:

- ☐h Provide additional cues of inadvertent sideslips and skids through control-force changes.
- ☐o Ensure that short periods of unattended operation do not result in any significant changes in yaw or bank angle.
- ☐n Provide predictable roll and yaw response.
- ☐r Provide an acceptable level of pilot attention (workload) to attain and maintain a coordinated turn.

Static longitudinal stability on airplanes with mechanical links to the pitch-control surface means that a pull force on the controller results in a reduction in speed relative to the trim speed, and a push force on the controller results in higher than trim speed. Longitudinal stability is required by the regulations for the following reasons:

- sSpeed change cues are provided to the pilot through increased and decreased forces on the controller.
- pShort periods of unattended control of the airplane do not result in significant changes in attitude, airspeed, or load factor.
- oA predictable pitch response is provided to the pilot.
- An acceptable level of pilot attention (workload) to attain and maintain trim speed and altitude is provided to the pilot.
- nLongitudinal stability provides gust stability.

Past experience on airplanes fitted with a flight-control system providing neutral longitudinal stability reveals insufficient feedback cues to the pilot for excursion below normal operational speeds. The maximum angle-of-attack protection system limits the airplane angle of attack and prevents stall during normal operating speeds, but this system is not sufficient to prevent stall at low-speed excursions below normal operational speeds. Until intervention, the pilot receives no stability cues because the airplane remains trimmed. Additionally, due to thrust variation, flight-control laws reduce feedback from the pitching moment. Low-speed excursions may become more hazardous without the typical longitudinal stability, and recovery may become more difficult when the low-speed situation is associated with a low altitude, and with the engines at low thrust or in performance-limiting conditions.

These special conditions contain the additional safety standards that the Administrator considers necessary to establish a level of safety equivalent to that established by the existing airworthiness standards.

### **Applicability**

As discussed above, these special conditions are applicable to Bombardier Model BD-700-2A12 and BD-700-2A13 series airplanes. Should Bombardier apply at a later date for a change to the type certificate to include another model incorporating the same novel or unusual design feature, these special conditions would apply to that model as well.

## **Conclusion**

This action affects only a certain novel or unusual design feature on Bombardier Model BD-700-2A12 and BD-700-2A13 series airplanes. It is not a rule of general applicability.

The substance of these special conditions has been subjected to the notice and comment period in several prior instances and has been derived without substantive change from those previously issued. It is unlikely that prior public comment would result in a significant change from the substance contained herein. Therefore, because a delay would significantly affect the certification of the airplane, the FAA has determined that prior public notice and comment are unnecessary and impracticable, and good cause exists for adopting these special conditions upon publication in the **Federal Register**.

The FAA is requesting comments to allow interested persons to submit views that may not have been submitted in response to the prior opportunities for comment described above.

## **List of Subjects in 14 CFR Part 25**

Aircraft, Aviation safety, Reporting and recordkeeping requirements.

The authority citation for these special conditions is as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701, 44702, 44704.

## **The Special Conditions**

Accordingly, pursuant to the authority delegated to me by the Administrator, the following special conditions are issued as part of the type certification basis for Bombardier Inc. Model BD-700-2A12 and BD-700-2A13 series airplanes.

In lieu of the requirements of §§ 25.171, 25.173, 25.175 and 25.177(c), the following special conditions apply:

1. The airplane must be shown to have suitable static lateral, directional, and longitudinal stability in any condition normally encountered in service, including from the effects of atmospheric disturbance. The showing of suitable static lateral, directional, and longitudinal stability must be based on the airplane handling qualities, including pilot workload and pilot compensation, for specific test procedures during the flight-test evaluations.
2. The airplane must provide to the pilot adequate awareness of a low-energy (low speed, low thrust, low height) state when fitted with flight-control laws presenting neutral longitudinal stability significantly below the normal operating speeds. “Adequate awareness” means warning information that alerts the flightcrew of unsafe operating conditions, allowing the flightcrew to take appropriate corrective action.
3. The following requirement must be met for the configurations and speed specified in paragraph (a) of § 25.177. In straight, steady sideslips over the range of sideslip angles appropriate to the operation of the airplane, the rudder-control movements and forces must be substantially proportional to the angle of sideslip in a stable sense. This factor of proportionality must lie between limits found necessary for safe operation. The range of sideslip angles evaluated must include those sideslip angles resulting from the lesser of:
  - a. One-half of the available rudder-control input; and



b. A rudder-control force of 180 pounds.

Issued in Renton, Washington, on February 10, 2017.

/s/

Michael Kaszycki

Assistant Manager, Transport Airplane Directorate

Aircraft Certification Service

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